National Defence / Défense nationale

INTRODUCING THE DREO ELINT BROWSER UTILITY (DEBU)

by

B. Ford and D. Jones
Radar ESM Section
Electronic Warfare Division

DEFENCE RESEARCH ESTABLISHMENT OTTAWA
TECHNICAL NOTE 91-7

PCN
011LB13

July 1991
Ottawa

ABSTRACT

DREO developed an Elint database browsing tool, called DEBU, that allows Elint databases, such as Kilting, EWIR and AFEWC, to be easily reviewed and analyzed from a PC workstation. DEBU's basic function is to allow a user to examine the contents of user-selected subfiles of user-selected emitters of user-selected databases. DEBU augments this functionality with support for selecting (filtering) and combining subsets of emitters by user-selected attributes such as ELNOT, name, parameter type or parameter value. DEBU provides access to facilities for examining histograms and x-y plots of selected parameters as well as the generation and printing of a variety of reports. With its multiple windows, pop-up menus and help support, DEBU is easy to use.

RÉSUMÉ

Le CRDO a développé un logiciel de lecture des bases de données d'intelligence électronique appelé DEBU. Cet outil permet de visualiser et d'analyser les bases de données Kilting, EWIR et AFEWC sur un ordinateur personnel de type PC. Normalement, DEBU est utilisé pour examiner le contenu d'un sous-fichier constitué d'émetteurs choisis par l'utilisateur. Des fonctions avancées permettent de choisir, filtrer, et combiner des sous-ensembles d'émetteurs selon des caractéristiques telles que le ELNOT, le nom de l'émetteur, le type d'un paramètre, ou la valeur d'un paramètre. DEBU offre aussi la possibilité d'examiner les paramètres choisis sous forme d'histogrammes et de courbes, et permet de générer et d'imprimer un éventail de rapports. Ses multiples fenêtres, menus et son système interactif d'aide rendent DEBU très facile à utiliser.

EXECUTIVE SUMMARY

A number of Elint databases exist that contain information on radar emitters. The most detailed of these databases, including Kilting, EWIR and AFEWC, are made up almost entirely of optional records and fields, which conventional database management systems are not designed to handle. As a consequence, there has been a significant lack of effective tools to review and analyze the information in these databases.

DREO developed an Elint database browsing tool, called DEBU, that allows Elint databases to be easily reviewed and analyzed from a PC workstation. DEBU's basic function is to allow a user to examine the contents of user-selected subfiles of user-selected emitters of user-selected databases. DEBU augments this functionality with support for selecting (filtering) and combining subsets of emitters by user-selected attributes such as ELNOT, name, parameter type or parameter value. DEBU provides access to facilities for examining histograms and x-y plots of selected parameters as well as the generation and printing of a variety of reports. With its multiple windows, pop-up menus and help support, DEBU is easy to use. DEBU accesses data and processes requests with good speed so the operator always feels the environment is responsive and interactive.

This paper is intended to introduce DEBU to those in the Elint community who were not previously aware of the utility, to describe the current functionality for those who are using or will have a need to use DEBU, and to complete the description of DEBU with its history and its future plans. This paper may be used as the user's manual for those receiving DEBU Beta Version 2.0. It is assumed DEBU users are familiar with the contents and structures of the Elint databases.

A brief history of DEBU from its inception at DREO, due to the requirement for an object-oriented emitter library, through to its use as a user-friendly interactive browsing tool is traced.

DEBU runs on PC-AT compatible computers (286 or better) with at least 4 MB of extended memory, enough disk space for the Elint databases of interest and Digitalk Smalltalk V/286 software. Mouse and floating-point processor are optional but highly recommended. For hard-copy report generation, a PostScript laser writer is required.

A description is included of how to install and run DEBU and how to load and use the Elint databases.

The full functionality of DEBU is described on a pane by pane basis with respect to the menu items that can be selected in each pane. In addition to the general Smalltalk background area and the DEBU window label bar are the following panes: databases list, databases subsets, emitters list, parameters/subfiles list, text, and parameters/subfiles label.

The functions of the Smalltalk main menu are described. The help facility available in DEBU is described. Also, the functions associated with the label bar are listed.

For the databases list pane the main menu functionality is described. This functionality varies according to whether a root database is selected, a non-root database is selected, nothing is selected, or more than one database is selected.

For the database subsets pane the main menu functionality is described. The functionality varies depending on whether a database or no database is selected.

The functionality for the emitters list pane is given. The functionality changes depending on whether one emitter, more than one emitter, or no emitters are selected.

The functionality for the parameters or subfiles list pane is described. The functionality depends on whether parameters or subfiles are being analyzed. If parameters are being analyzed then functionality depends on whether nothing is selected, one item is selected, two numeric items are selected, or two (not both numeric) or three or more items are selected. Parameter analysis can involve a numeric histogram or an alphanumeric histogram. Manipulation of these histograms is described. If subfiles are being analyzed then functionality depends on whether nothing, one item, or more than one item is selected.

The functionality of the text pane is described; and the parameters/subfile label choice is indicated.

Often the user will want to obtain a hard-copy or report of the data he has obtained in DEBU. The many ways of obtaining prints and the many formats of data are described.

Finally, the improvements and plans for the general release version of DEBU are presented.

TABLE OF CONTENTS

		PAGE
ABSTRACT/RESUME		iii
EXECUTIVE SUMMARY		v
TABLE OF CONTENTS		vii
LIST OF FIGURES		xi
1.0	INTRODUCTION	1
2.0	HISTORY	2
3.0	EQUIPMENT AND INSTALLATION	3
4.0	CURRENT FUNCTIONALITY	4
4.1	General	6
4.1.1	Smalltalk Main Menu	6
4.1.2	Help	7
4.2	Pane 2 - Label Bar	8
4.2.1	Main Menu for Pane 2	8
4.3	Pane 3 - Databases List	10
4.3.1	Main menu for Pane 3 IF a Root Database is Selected	10
4.3.2	Main Menu for Pane 3 if a Non-Root Database is Selected	11
4.3.3	Main Menu for Pane 3 if Nothing is Selected	11
4.3.4	Main Menu for Pane 3 if More Than One Database is Selected	11
4.4	Pane 4 - Database Subsets	11
4.4.1	Main Menu for Pane 4 if no Database Subset is Selected	12
4.4.2	Main Menu for Pane 4 if a Database Subset is Selected	12
4.5	Pane 5 - Emitters List	12
4.5.1	Main Menu for Pane 5 with One Emitter Selected	13
4.5.2	Main Menu for Pane 5 with More Than One Emitter Selected	14
4.5.3	Main Menu for Pane 5 with No Emitters Selected	14

TABLE OF CONTENTS (cont)

		PAGE
4.6	Pane 6 - Parameters or Subfiles List	15
4.6.1	Main Menu for Pane 6 with Parameters - Nothing Selected	15
4.6.2	Main Menu for Pane 6 with Parameters - One Selection	16
4.6.3	Main Menu for Pane 6 with Parameters - Two Selections, Both Numeric	20
4.6.4	Main Menu for Pane 6 with Parameters - Two Selections but not Both Numeric or Three or More Selections	20
4.6.5	Main Menu for Pane 6 with Subfiles - Nothing Selected	21
4.6.6	Main Menu for Pane 6 with Subfiles - One Selection	21
4.6.7	Main Menu for Pane 6 with Subfiles - More than One Selection	21
4.7	Pane 7 - Text	21
4.7.1	Main Menu for Pane 7	21
4.8	Pane 8 - Parameters/Subfiles Label	22
5.0	PRINT-OUTS	23
6.0	SUMMARY AND PLANS	24
7.0	REFERENCE	25

LIST OF FIGURES

		PAGE
FIGURE 4.1:	PANES AND AREAS OF INTEREST FOR MAIN DEBU WINDOW	5
FIGURE 4.2:	LABEL BAR	9
FIGURE 4.3:	THE PANES OF THE HISTOGRAM WINDOW	17

1.0 INTRODUCTION

A number of Elint databases exist that contain information on radar emitters. The most detailed of these databases, including Kilting, EWIR and AFEWC, are made up almost entirely of optional records and fields, which conventional database management systems are not designed to handle. As a consequence, there has been a significant lack of effective tools to review and analyze the information in these databases.

DREO developed an Elint database browsing tool, called DEBU, that allows Elint databases to be easily reviewed and analyzed from a PC workstation. DEBU's basic function is to allow a user to examine the contents of user-selected subfiles of user-selected emitters of user-selected databases. DEBU augments this functionality with support for selecting (filtering) and combining subsets of emitters by user-selected attributes such as ELNOT, name, parameter type or parameter value. DEBU provides access to facilities for examining histograms and x-y plots of selected parameters as well as the generation and printing of a variety of reports. With its multiple windows, pop-up menus and help support, DEBU is easy to use. DEBU accesses data and processes requests with good speed so the operator always feels the environment is responsive and interactive.

There has been considerable interest in DEBU from within DREO, from within DND, from Defense departments in the United States, and from private industry in Canada and the United States. The general release DEBU with full functionality will not be complete until early 1992 but several early release copies of DEBU, with limited functionality, have already been distributed.

Due to the immediate interest in DEBU, a paper describing the current DEBU (Beta Version 2.0) was required. This paper is intended to introduce DEBU to those in the Elint community who were not previously aware of the utility, to describe the current functionality for those who are using or will have a need to use DEBU, and to complete the description of DEBU with its history and its future plans. This paper may be used as the user's manual for those receiving DEBU Beta Version 2.0. It is assumed DEBU users are familiar with the contents and structures of the Elint databases.

2.0 HISTORY

A number of years ago DREO began the development of a system to process pulse information from radar emissions in order to classify and identify emitters in the naval environment. The system was designed and implemented mainly in Smalltalk using an object-oriented methodology. The system would have its own library of emitter objects. Each emitter object could determine whether or not a given pulse stream could have been produced by it. DREO wanted the ability to automatically build emitter objects from the Kilting database. The design of emitter objects was, therefore, influenced by the information available from Kilting. This meant that the designer had a requirement to inspect the database to determine what information was available and what structures were required; and the implementer of the Kilting-to-Smalltalk-object translator had a requirement to extract particular information from the database. These requirements led to the development of a simple browsing facility within a Smalltalk environment.

For evaluation purposes, it became necessary to analyze and filter the contents of the DREO database, so more tools were developed, including facilities to examine data subsets, histograms and x-y plots. Later these facilities were incorporated in the Elint database browser.

It was found that the information in EWIR was required for the DREO system so the ability to access more than one database was added. At this point Kilting, EWIR and the DREO object-oriented database could all be easily studied using the browser.

Interest in this facility extended to other groups at DREO who required Elint database review and analysis for other purposes. The capabilities of the browser were described to various DND agencies, where much interest was shown. As each additional group became interested and familiar with the browser their specific requirements became known and tools to meet their needs were, if possible, incorporated into the package.

At this stage the browser was already user-friendly and had considerable functionality. Copies of the browser were passed to interested DND agencies, and many DREO scientists used the browser for their own research projects. The feedback from this expanded set of users identified the needs for a comprehensive package, now called DEBU. A contract is currently under way to incorporate this expanded set of requests and suggestions. An interim version of DEBU is available now and is described in this paper.

3.0 EQUIPMENT AND INSTALLATION

DEBU runs on PC-AT compatible computers (286 or better) with at least 4 MB of extended memory, enough disk space for the Elint databases of interest and Digitalk Smalltalk V/286 software [1]. Mouse and floating-point processor are optional but highly recommended. For hard-copy report generation, a PostScript laser writer is required.

The essential DEBU software consists of a Smalltalk IMAGE file, a GO file and a CHANGE.LOG file. The IMAGE file is a "snapshot" of the Smalltalk environment. Each time Smalltalk is started, the last saved image is restored. As Smalltalk starts, it executes the contents of the GO file. The GO file is a plain text file that tells Smalltalk what kind of monitor the system has and the location of various files. It is important that the user review this file and, if necessary, modify it to suit the operational environment. The CHANGE.LOG file records changes to Smalltalk methods and will be created if it is missing. The user should refer to Smalltalk documentation for more details.

The GO file also informs DEBU where to find the Elint databases and what their names will be. On startup, DEBU checks whether each named database has been incorporated. If a database is new (not incorporated), DEBU proceeds to read the database file and build an internal index of all of the emitters. If the file does not exist, DEBU attempts to read the file from tape.

Elint databases are normally delivered on 9-track tape. If a compatible tape drive is available, DEBU can copy the file from the tape to a user-specified directory. DEBU converts the file from blocks to lines with trailing blanks removed terminated with linefeeds. If, on the other hand, a compatible tape drive is not available, then the user must explore alternate ways of installing DEBU-format Elint databases. For example, the user might have to locate another DEBU-user who has the database of interest and use a backup facility to copy the database onto compatible media for transfer.

Typically, Smalltalk software is installed in one directory, DEBU software in another directory and pictures in yet another. The user should copy all supplied batch files to a batch directory (often C:\BATCH or C:\BAT). If necessary, the user should create such a directory and edit the PATH specification in C:\AUTOEXEC.BAT to reference this directory. DEBU batch files should be reviewed to ensure that directory references are correct.

3.1 DEBU Start-Up

To start DEBU, the user types the command "DEBU" at the DOS prompt. This invokes a supplied batch file which changes the current directory to the DEBU directory and starts Smalltalk. Smalltalk restores the last saved image. If DEBU is not one of the displayed windows, the user can pop up a system menu (described in section 4.1.1) and select DEBU.

4.0 CURRENT FUNCTIONALITY

This section describes all of the functionality of the current release of DEBU, referred to as DEBU 2.0. The main window for DEBU is shown in Figure 4.1. The window comprises a number of panes in addition to the background around the window. The functionality available for each of these panes is described separately. In addition to a general discussion, which includes information on the functionality available for the background area behind the DEBU window and the help utility common to all panes, there is a description of the functionality in the panes for the label bar (Pane 2), the databases list (Pane 3), the database subsets (Pane 4), the emitters list (Pane 5), the parameters/subfiles list (Pane 6), the text (Pane 7), and the parameters/subfiles label (Pane 8). Pane numbers for DEBU are shown in Figure 4.1.

It should be noted that if a user wishes to compare information in more than one area of interest, for example two databases, it is possible to open two or more DEBU windows simultaneously. Each DEBU window operates independently. This would be useful for comparisons between databases or data samples.

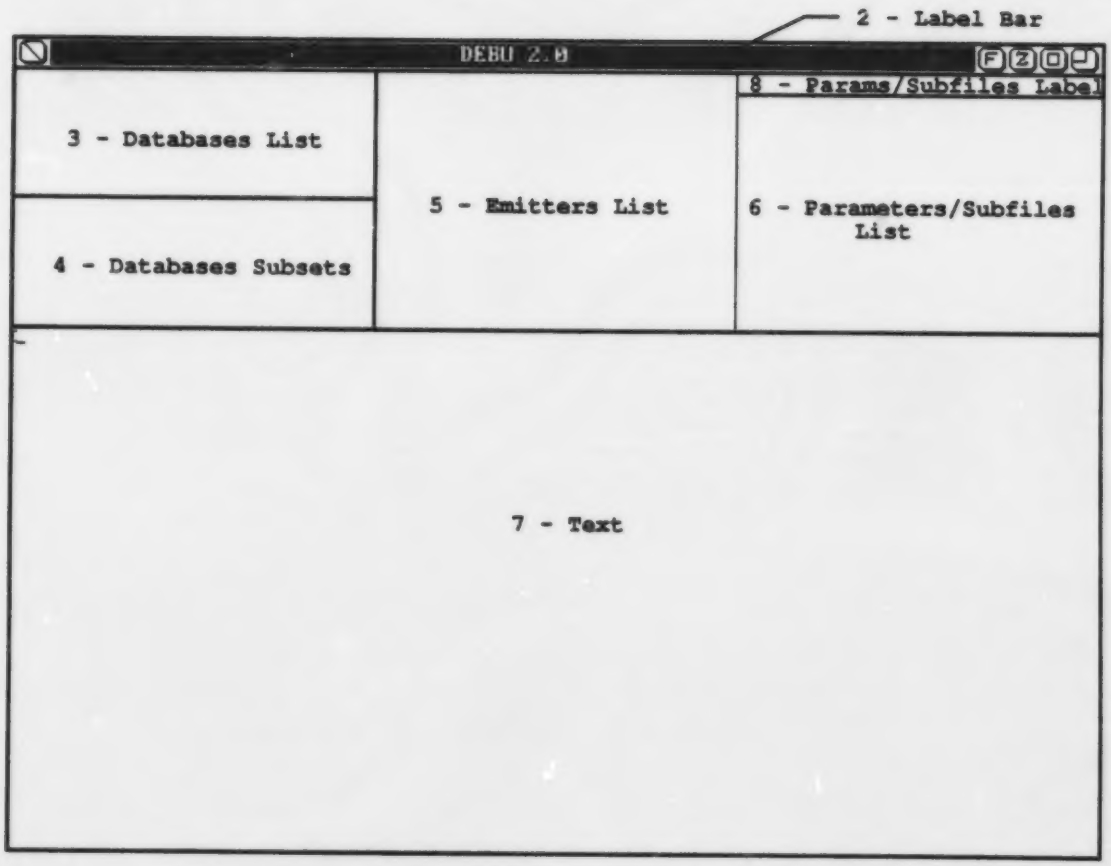

Figure 4.1 Panes and Areas of Interest for Main DEBU Window

4.1 General

In the Smalltalk environment, the user manipulates applications through dedicated windows. Windows are organized as a collection of panes; each of which is typically a list pane or a text pane. List panes display a list of items from which the user may choose. Text panes show text and sometimes may be edited. There is also a system window, which comprises all parts of the screen not covered by an application window.

To select an item in a list pane, simply move the cursor with the mouse to the line of interest and click the left mouse button. A second click on the same line will deselect the line. To select more than one item, hold the shift key on the keyboard while selecting with the left mouse button.

Another way to select an item in a list pane is to move the cursor into the list pane and begin to type the contents of the desired line. As each new character is entered, the list repositions itself to the first matching line. To select that line, press ENTER on the keyboard or select with the mouse. To search for another line or to correct the search text, move the cursor out of the pane and then back in.

Menus are available for each pane. Move the cursor to the pane of interest and click the right mouse button. The menu appears. To select a menu item, move the cursor to the desired line and click with the left button. Help is available for virtually all menu items in DEBU. To get help, move the cursor to the line of interest and click with the right button.

It may happen that the list of information in the pane is longer or wider than the space provided by the pane. The technique for manoeuvring through the text is the same as for Smalltalk in general. A scroll bar, for manoeuvring up and down through the text, appears along the right side of the pane while the right-most mouse button is held down. It is possible to travel up, down, right and left by keeping the right-most mouse button depressed and dragging the arrow that appears in the desired direction.

4.1.1 Smalltalk Main Menu

The operations of the Smalltalk main menu are described here. From any background area on the screen not covered by a window the main menu can be opened by clicking the right-most button on the mouse. The main menu's functions include:

save image
: When terminating a session it is necessary to decide if changes were made that should be preserved, for example a subset of a database was created. If so, then upon exiting Smalltalk, save the image. The next time DEBU is run it will be in the exact state as when it was saved.

exit Smalltalk

This is used to exit Smalltalk and therefore DEBU. The user will be prompted with a choice of saving the image first or just exiting. If the user wishes the image to open in the same manner as previous times and nothing new has been created then the image need not be saved.

DEBU

If the DEBU browsing window is open when the software is started up then review and analysis can begin. Otherwise the DEBU browsing window can be opened by choosing the DEBU function on the main Smalltalk menu.

redraw screen

This is used if the content of the screen has been corrupted in some way.

4.1.2 Help

The help facility is available in each of the main menus for panes 3 through 7. If it is selected a supplementary menu pops up with the contents as follows.

about DEBU

DREO ELINT BROWSER UTILITY:
DEVELOPED AT
DEFENCE RESEARCH ESTABLISHMENT OTTAWA
(C) HER MAJESTY THE QUEEN
AS REPRESENTED BY THE MINISTER OF
NATIONAL DEFENCE, 1991

how to get menu help

Most menu items in the Elint Browser have help text available. Instead of selecting the menu item with the left button, select with the right button. A special window pops up. To exit from this window, select either of the two icons in the upper right. The 'X' icon cancels any changes to the text, if any; while the looping arrow icon saves any changes.

If further information is required, refer to the manual or contact the developers.

how to add a new database

1. Create a new directory for the new source database.
2. Edit the GO file to add the name and path of the new source database to the end of existing lists in the GO file.
3. Boot Smalltalk in the usual way. The boot installs the new database, so boot will take much longer than usual.

how to remove a database

To remove a database, select it and pop up the menu. Select REMOVE DATABASE. It is now removed from the image. If the database is a root database, derived databases will be removed. Edit the GO file to remove references to this database. Save the image to preserve the removal. Reboot Smalltalk in the usual way.

how to collect new parameters

Collect parameter of interest (POI) such as RF LIMITS, which will be used in the pruning of emitter lists.

1. Select an emitter which has the POI.
2. Select the subfile (right-most list) which has the POI.
3. Pop-up the menu and select the line COLLECT NEW PARAMETERS. Parameters available in the subfile are listed.
4. Select the POI. The browser will read the entire source database and collect the POI. This may take more than ten minutes, depending on the system.

how to exit

HOW TO EXIT SMALLTALK

Point the cursor at a spot on the screen outside of any windows and pop up the system menu. Select the line EXIT SMALLTALK. A secondary menu pops up asking whether to forget the image, save the image or continue. Save the image if any changes are to be preserved. Otherwise, forget the image.

HOW TO EXIT THE BROWSER

Click on the square icon in the upper left of the browser window.

4.2 Pane 2 - Label Bar

Refer to Figure 4.2 for the functions of the label bar buttons.

4.2.1 Main Menu for Pane 2

print

Print the Elint Browser window.

color

Change the colour of the text or the background.

collapse

Collapse window to show only the label bar.

cycle

Cycle through displayed windows.

frame

Resize the window.

move

Drag the window to a new location.

close

Close the window.

resize the window
collapse window to show only label bar
zoom text pane
change to next font in the series

close window

Figure 4.2 Label Bar Buttons

4.3 Pane 3 - Databases List

This pane lists all the names of the databases and database subsets available. If one of the databases is chosen (shown in reverse video) then the list of associated database subsets is shown in pane 4. The list of emitters associated with that database are listed in pane 5, the list of parameters available in the database is shown in pane 6 and some detail on the selected database is shown in pane 7. If more than one database is selected then combining can take place using the lists in pane 4.

4.3.1 Main Menu for Pane 3 if a Root Database is Selected

A root database is an entire original database.

remove database
: Remove the currently selected database from the list of available databases. If the selected database is a 'root' database, from which other databases are derived, it may not be removed until all of its derivatives have been removed. These will be listed. When selected, a window asks the operator to confirm his decision.

rename database
: Prompt the user for a new name for the selected database. If the name is accepted, the database will be renamed.

inspect notes
: Open a window on the dictionary of notes the operator may have made on different emitters.

special operations
: Pop up a secondary menu of special operations available for the selected root database.

Special operations - supplementary menu

count Tx antennas
: Determine the number of transmitting antennas of each database entry and add to the lookup. The problem here is that there is no simple way to determine whether a given database entry is a system which may simultaneously emit more than one beam. It was necessary to add specialized code to handle this.

count links in Suffix Tables
: Determine the number of links in the suffix tables. Links are optional numbers to the left of commas in suffix tables used to indicate modes which may appear concurrently. The number of links may be useful in determining how complex the emitter is.

collect stagger intervals

Collect stagger intervals for all emitters when available. The intervals collected are:

000001312215.20
000001312215.30
000001312215.40
000001312215.50
000001312215.60
000001312215.70
000001312215.80

collect all parameter types

Build a lookup relating each parameter type of the root database to a list of emitters having that type. This permits searches for all emitters having a particular parameter type, such as STAGGERED PRI. This operation should be performed only once after initial installation.

HELP - Described in 4.1.2.

4.3.2 Main Menu for Pane 3 if a Non-Root Database is Selected

remove database

Remove the currently selected database from the list of available databases. If the selected database is a 'root' database, from which other databases are derived, it may not be removed until all of its derivatives have been removed. These will be listed. When selected, a window asks the operator to confirm his decision.

rename database

Prompt the user for a new name for the selected database. If the name is accepted, the database will be renamed.

inspect notes

Open a window on the dictionary of notes the operator may have made on different emitters.

HELP - Described in 4.1.2.

4.3.3 Main Menu for Pane 3 if Nothing is Selected

HELP - Described in 4.1.2.

4.3.4 Main Menu for Pane 3 if More than One Database is Selected

HELP - Described in 4.1.2.

4.4 Pane 4 - Database Subsets

If one of the subsets is chosen (shown in reverse video) then the text pane gives more detail on that subset.

4.4.1 Main Menu for Pane 4 if no Database Subset is Selected

combine lists
Pop up a supplementary menu for combining (joining, merging) user-selectable derived emitter lists. The derived list is added to the end of the list of derived emitter lists.

Combine lists - supplementary menu

and: intersection of list 1 and list 2
Derive a new list of emitters which comprise the emitters common to both List 1 and List 2 (their intersection). List 1 and List 2 are prompted for.

xor: union without intersection
Derive a new list of emitter which comprise all of List 1 and List 2 (their union) without emitters common to both (their intersection). This is analogous to the exclusive OR (XOR) operation of boolean logic. List 1 and List 2 are prompted for.

or: list 1 + list 2
Derive a new list of emitters which comprises all of both List 1 and List 2 (their union). This is analogous to the OR operation of boolean logic. List 1 and List 2 are prompted for.

list 1 - list 2
Derive a new list of emitters which is List 1 without emitters of List 2. List 1 and List 2 are prompted for.

HELP - Described in 4.1.2.

4.4.2 Main Menu for Pane 4 if a Database Subset is Selected

combine lists - see 4.4.1.

make database from list
Make the currently selected list available as a named database. This is the only way that lists may be saved for later reference. On exiting from Smalltalk, save the image; otherwise the new database will be lost. A name choice is prompted for.

HELP - Described in 4.1.2.

4.5 Pane 5 - Emitters List

The list of emitters is usually long. One or more emitters may be selected by clicking the left-most mouse button while the cursor points to the line of interest. If the operator wishes to view information off the screen then he may use the scroll bar. If the operator wishes to jump to the area in the emitter list

beginning with certain alphanumerics then by typing one or more characters on the keyboard the viewed portion of the list jumps to the line beginning with the selected characters. (Note the cursor must remain in the window of interest.)

If one emitter is selected (shown in reverse video) then, depending on the pane 8 selection, the list of subfiles for which there is information for that emitter or the list of parameters associated with the emitter is shown in pane 6. If the subfile switch is chosen the text pane lists the suffix table. If more than one emitter is selected (each shown in reverse video) then the operator can view in pane 6 the list of subfiles for which there is information for those emitters or the list of parameters associated with those emitters. If no emitter is selected the operator can still view the subfiles or parameters lists that would be associated with all the emitters, again in pane 6.

4.5.1 Main Menu for Pane 5 with One Emitter Selected

view picture

If a picture is available, show it at the upper left part of the screen. Pictures are in external TIF format files scanned from an ECM handbook.

view source

View the raw text for the selected emitter in a separate window. This text comprises all of the records of the selected emitter.

Note that the Elint Browser does not show entire records. Also, it is possible that a comment might be missed if the only reference to the missed comment is another comment.

Options for Printing

Pop up a supplementary menu for selecting what is to be filed out. This selection is accessible if no emitters are selected, or one or more emitters are selected. If no emitters are selected it is assumed the whole database is to be filed out. A warning to the user will indicate the magnitude of this selection. If more than 20 emitters are selected the warning of magnitude appears as well.

Options for Printing - supplementary menu

print formatted source

Print the full formatted report on all information in the database available for each selected emitter. If no emitters are selected then print the full report for all emitters in the database.

print raw source

The entire source text for each selected emitter is printed. If no emitter is selected then print the source for all emitters in the database.

print user notes
Print the notes, input by the user[s], associated with the selected emitters. If no emitter is selected then print the entire list of user notes.

make notes on selection
Pop up a window to allow operator to add or modify notes on the selected emitter.

special operations
This is reserved for those building test libraries.

HELP - Described in 4.1.2.

4.5.2 Main Menu for Pane 5 with more than One Emitter Selected

Options for Printing - see 4.5.1

create database subset with selection
Create a new database subset consisting of just the selected emitters.

create database subset without selection
Create a new database subset consisting of all the emitters of the currently selected database subset except those selected.

special operations
This is reserved for those building test libraries.

HELP - Described in 4.1.2.

4.5.3 Main Menu for Pane 5 with no Emitters Selected

select by name
Pop up a prompter requesting a string fragment to match. This string will be matched against the names of all emitters in the currently selected database subset. Emitters with names containing the string fragment are collected into a new database subset.

select by comment search
Pop up a prompter requesting a string fragment to match. This string will be matched against the comments of all emitters in the currently selected database subset. Emitters with the comment containing the string fragment are collected into a new database subset.

select by notation
Pop a prompter requesting an ELINT notation (ELNOT) to match. The ELNOT is presented as a five character string of '*'s ('*' can match any character). Each '*' may be replaced with a letter or number to match.

Emitters of the currently selected database subset which match the query are collected into a new database subset.

select by measurement

Prompt the user for a measurement parameter from the current list of parameters (same as the list of parameters available in the right-most list pane). Then prompt for the actual measurement to match. Collect all emitters from the current database subset which match the desired measurement.

Numeric measurements are often shown as ranges: eg. (2000 >> 9000). Prompters for numeric measurements initially show the full span of the observed range.

reject by notation

Pop up a prompter requesting an ELINT notation (ELNOT) to match. The ELNOT is presented as a five character string of '*'s ('*' can match any character). Each '*' may be replaced with a letter or number to match.

A new database subset is created from the currently selected database subset excluding emitters with notations which match the query.

reject by measurement

Prompt the user for a measurement parameter from the current list of parameters (same as the list of parameters available in the right-most list pane). Then prompt for the actual measurement to match. Collect all emitters from the current database subset which do not match the entered measurement.

Numeric measurements are often shown as ranges: eg. (2000 >> 9000). Prompters for numeric measurements initially show the full span of the observed range.

Options for Printing - see 4.5.1

HELP - Described in 4.1.2.

4.6 Pane 6 - Parameters or Subfiles List

Pane 8 allows a switch between the subfiles list and the parameters list.

4.6.1 Main Menu for Pane 6 with Parameters - Nothing Selected

add parameter by name

DEBU does not allow you to directly add a parameter by name because the same name may have more than one tree node number. For example, RF LIMITS appears for both RF and CW. To indirectly add a parameter by name, select an emitter and subfile likely to have the desired parameter. Pop up the subfiles menu and select the option to add a new parameter. A list of the available parameters will be displayed. Select the desired parameter. After collecting the parameter, save the image.

add parameter by tree node number

The user is prompted for the tree node number of the parameter of interest (POI). The browser will then read the entire source database and collect the POI. The default name of the parameter will be the label of the first record matching the entered tree node number. Collection may take more than ten minutes, depending on system and size of database.

HELP - Described in 4.1.2.

4.6.2 Main Menu for Pane 6 with Parameters - One Selection

Information on the selection is shown in the text pane (pane 7).

histogram

Open a new window for browsing the histogram of the selected parameter. Two types of histograms are available, numeric and alphanumeric, depending on the type of data to be histogrammed.

Numeric histogram:

There are 4 panes in this histogram window. See Figure 4.3.

If the data is numeric the histogram shows the numeric values of the parameter along the x-axis, divided into bins.

Pane H1 - Label Bar

This label bar behaves in the same manner as the label bar described in section 4.2.

Pane H2 - Histogram

The bin width is calculated by the system to be a round number (1 or a multiple of 10) such that there will be less than 1000 bins. Bins may be selected by clicking with the cursor in the bin of interest. More than one bin may be selected by clicking with the cursor in the bins of interest while the shift key is pressed. The selected bins are underscored with a heavy line along the x-axis.

Emitters contained in the selected bins are listed in the emitter list pane (H3).

MAIN MENU FOR PANE H2

restore

Restore the original histogram.

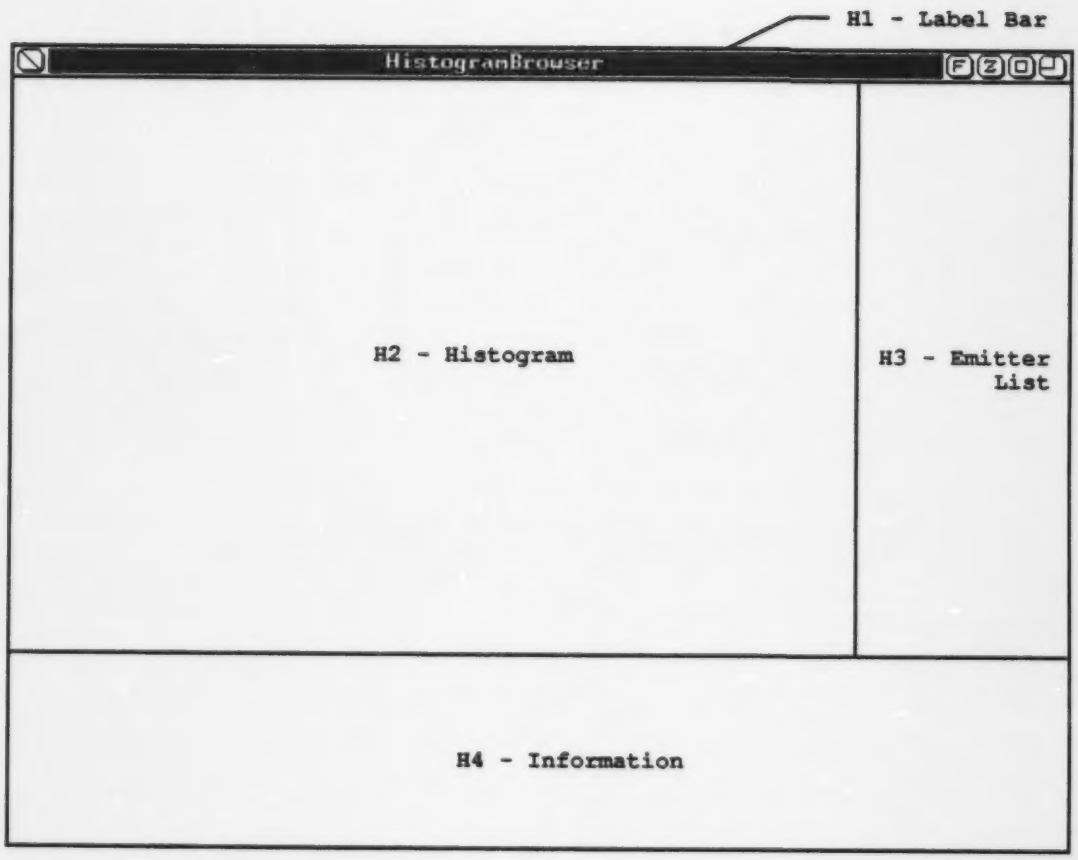

Figure 4.3 The Panes of the Histogram Browser Window

change bin width
The user is prompted for a new bin width. The previous bin width is offered as the default. The histogram is redrawn with the new bin width.

zoom selection
Expand the selected part of the histogram to fill the entire pane.

statistics
Pop up a supplementary menu for statistics options.

Statistics - supplementary menu

means histogram
Open a new histogram browser on the means of the histogram. Means are calculated as follows. For each object of the histogram, calculate the mean value of the centres of all the measurement values.

standard deviations histogram
Open a new histogram browser on the standard deviations of the histogram. Standard deviations are calculated as follows. For each object of the histogram, calculate the standard deviation of the centres of all the measurement values.

percent deviation histogram
Open a new histogram browser on the percent deviations of the histogram. Percent deviation is the ratio of the standard deviation over the mean, expressed as a percentage.

percent spread histogram
Open a new histogram browser on the percent spread of the histogram. Percent spread is the ratio of the maximum distance from the mean over the mean, expressed as a percentage.

percent width histogram
Open a new histogram browser on the percent width of the histogram. Percent width is the ratio of the maximum width over the mean, expressed as a percentage.

Pane H3 - Emitter list

If one or more bins have been selected in the histogram pane (H2) then the emitters contained in those bins are listed in this pane. If an emitter in the list is highlighted, information on that emitter is displayed in the bottom pane (H4).

Main menu for Pane H3 if one emitter is selected

look at tags
Open a window on the selected tags (emitters).

remove tags

Remove selected tags (emitters) from current list of tags. Show the resultant histogram without the removed tags.

Main menu for Pane H3 if no emitters selected

remove all tags

Remove all tags from the list of emitters. Show the resultant histogram without the tags that have been removed.

zoom on tags

Show the histogram indicating only the range of bins containing the tags in the list. Note: a tag may be in more than one bin.

Pane H4 - information

This pane contains general information about the histogram if no emitter in pane H3 is selected. Otherwise it contains information on the selected emitter.

Main menu for Pane H4

zoom on text

Zoom text to fill entire screen. This is useful if the text pane has a lot of information. To exit zoom, either press function key F8 or, with the mouse, click on the label bar at the top of the screen.

Alphanumeric histogram:

The 4 panes in the alphanumeric histogram are in the same positions as for the numeric histogram (see Figure 4.3), only the content is different. In the histogram pane (H2) each alphanumeric name is listed down the left side of the pane and the number of occurrences of each is indicated on each associated line.

If an emitter (or tag) is selected in pane H3 then all the bins containing that emitter are shown in the histogram (pane H2).

Pane H1 - Label Bar

This label bar behaves in the same manner as the label bar described in section 4.2.

Pane H2 - Histogram

Each bin represents an alphanumeric element. The number of occurrences for each element is indicated. An element may be selected by clicking on it; emitters related to that element are listed in pane H3.

Main menu for Pane H2

restore
Restore the original histogram.

Main menu for Pane H3

This is the same as for pane H3 for numeric histograms.

Main menu for Pane H4

This is the same as for pane H4 for numeric histograms.

parameter report by candidates
List the parameters in the text pane ordered by candidates.

parameter report by parameter
This is the default. List the parameters in the text pane ordered by parameter.

HELP - Described in 4.1.2.

4.6.3 Main Menu for Pane 6 with Parameters - Two Selections, Both Numeric

2-dimensional plot
Open a new window for browsing a 2-dimensional plot of the two numeric parameters that are selected. This is not currently implemented.

parameter report by candidates
List the parameters in the text pane, ordered by candidates.

parameter report by parameter
This is the default. List the parameters in the text pane, ordered by parameter.

HELP - Described in 4.1.2.

4.6.4 Main Menu for Pane 6 with Parameters - Two Selections but not Both Numeric, or Three or More Selections

parameter report by candidates
List the parameters in the text pane, ordered by candidates.

parameter report by parameter
The is the default. List the parameters in the text pane, ordered by parameter.

HELP - Described in 4.1.2.

4.6.5 Main Menu for Pane 6 with Subfiles - Nothing Selected

HELP - Described in 4.1.2.

4.6.6 Main Menu for Pane 6 with Subfiles - One Selection

collect new parameters

Collect parameter of interest (POI) such as RF LIMITS, which will be used in the pruning of emitter lists.

1. Select an emitter which has the POI.
2. Select the subfile (right-most list) which has the POI.
3. Pop-up the menu and select the line COLLECT NEW PARAMETERS. Parameters available in the subfile are listed.
4. Select the POI. The browser will read the entire source database and collect the POI. This may take more than ten minutes, depending on the system.

print subfile

Print selected subfile(s) as a formatted report.

HELP - Described in 4.1.2.

4.6.7 Main Menu for Pane 6 with Subfiles - More than One Selection

collect new parameters

Collect parameter of interest (POI) such as RF LIMITS, which will be used in the pruning of emitter lists.

All parameters available in the currently selected subfile are listed in a prompter window. Select the parameter of interest. DEBU will read the entire source database and collect the POI. This may take more than ten minutes, depending on system.

DEBU will, upon confirmation, save the image to preserve the change.

HELP - Described in 4.1.2.

4.7 Pane 7 - Text

4.7.1 Main Menu for Pane 7

zoom text

Zoom text to fill entire screen. This is useful if the text pane has a lot of information. To exit zoom, either press function key F8 or, with the mouse, click on the label bar at the top of the screen.

search

Search forward from the insertion point or highlighted text for the next occurrence of the current search string. Search is case sensitive. The insertion point, indicated by an 'I', is re-positioned just after this occurrence. If the string is not found, the insertion point is moved to the end of the text. If no text is highlighted, then the user is prompted for a search string.

search back

Search backwards from the insertion point or highlighted text for the next occurrence of the current search string. Search is case sensitive. The insertion point, indicated by an 'I', is re-positioned just after this occurrence. If the string is not found, the insertion point is moved to the end of the text. If no text is highlighted, then the user is prompted for a search string.

print contents

Print all contents of the text pane.

4.8 Pane 8 - Parameters/Subfiles Label

The operator can choose between whether he wishes to list parameters or subfiles in Pane 6.

5.0 PRINT-OUTS

Often the user will want to obtain a hard-copy or report of the data he has obtained in DEBU. There are many ways of obtaining prints and the data can be in many formats.

Some of the print functionality has already been seen in section 4.0. For example, in section 4.5.1 there are options to print the full report, print the source, or print user notes. In section 4.6.6 there is an option to print one or more selected subfiles. In section 4.7.1 there is an option to print the entire contents of the text pane.

In addition to these formatted print capabilities set up by DEBU, the user can print any window, the whole screen, or the contents of the text pane. Whole windows are printed out by clicking in the label bar of the window and choosing the print option. To print out the whole or any part of the screen choose function key F2. The user will be requested to frame the portion of the screen to print out. With these facilities, virtually any data can be printed.

Currently, DEBU supports the printing of text and pictures to a PostScript printer (AppleLaser II). Prior to printing, a dialog window appears which sets up the classification, headers, footers, page numbering and orientation for the document.

6.0 SUMMARY AND PLANS

DEBU was created and is being optimized due to a need in the ESM and Elint community to be able to review and analyze Elint databases easily and effectively. This report introduces DEBU, gives a brief history, describes the equipment necessary to run DEBU and gives the installation and start-up instructions. A major part of the report describes the current functionality of DEBU 2.0. The functionality section may be used as a user's manual for DEBU Beta Version 2.0.

In addition to the functionality described in the previous section additional capability will be available in the general release version of DEBU. The expanded and improved features are described in this section. The general release version of DEBU is to be available early in 1992.

In addition to DEBU recognizing Kilting, EWIR and AFEWC databases the EPL and NEDB database formats will be recognized. Since the formats are very different new search and retrieve techniques will be required.

Currently DEBU supports the browsing of histograms and soon DEBU will support browsing of two-parameter plots. Parameters to be investigated may be chosen and input by the user.

Some ambiguity analysis will also be available. The plan is to treat ambiguity sets like parameters. Ambiguity sets are collections of emitters which overlap in all of the parameters for which it is defined. There will be the capability of choosing a set of parameter values and DEBU will determine which emitters overlap that set.

Print-out pruning will be available. For example, a parameter subfile may be selected so only the subset will be printed.

More radar pictures for selected ELNOTS are to be made available on-line.

Some mode expansion or suffix table expansion capability will be available, depending upon the complexity of the problem.

There will be the capability for users to edit the database, for example if the user knows of errors. These edits will not affect the original database but it will appear to the user as though his changes are in the database.

7.0 REFERENCE

[1] "Smalltalk/V 286 Tutorial and Programming Handbook", Digitalk Inc., 1988.

DOCUMENT CONTROL DATA

(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)

1. ORIGINATOR (the name and address of the organization preparing the document. Organizations for whom the document was prepared, e.g. Establishment sponsoring a contractor's report, or tasking agency, are entered in section 8.)

NATIONAL DEFENCE
DEFENCE RESEARCH ESTABLISHMENT OTTAWA
SHIRLEY BAY, OTTAWA, ONTARIO K1A 0K2 CANADA

2. SECURITY CLASSIFICATION (overall security classification of the document. including special warning terms if applicable)

UNCLASSIFIED

3. TITLE (the complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S,C or U) in parentheses after the title.)

INTRODUCING THE DREO ELINT BROWSER UTILITY (DEBU) (U)

4. AUTHORS (Last name, first name, middle initial)

FORD, BARBARA J., JONES, DAVID A.C.

5. DATE OF PUBLICATION (month and year of publication of document)

JULY 1991

6a. NO. OF PAGES (total containing information. Include Annexes, Appendices, etc.)

34

6b. NO. OF REFS (total cited in document)

N/A

7. DESCRIPTIVE NOTES (the category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

DREO TECHNICAL NOTE

8. SPONSORING ACTIVITY (the name of the department project office or laboratory sponsoring the research and development. Include the address.)

NATIONAL DEFENCE
DEFENCE RESEARCH ESTABLISHMENT OTTAWA
SHIRLEY BAY, OTTAWA, ONTARIO K1A 0K2 CANADA

9a. PROJECT OR GRANT NO. (if appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant)

011LB13

9b. CONTRACT NO. (if appropriate, the applicable number under which the document was written)

10a. ORIGINATOR'S DOCUMENT NUMBER (the official document number by which the document is identified by the originating activity. This number must be unique to this document.)

DREO TECHNICAL NOTE 91-7

10b. OTHER DOCUMENT NOS. (Any other numbers which may be assigned this document either by the originator or by the sponsor)

11. DOCUMENT AVAILABILITY (any limitations on further dissemination of the document, other than those imposed by security classification)

(X) Unlimited distribution
( ) Distribution limited to defence departments and defence contractors; further distribution only as approved
( ) Distribution limited to defence departments and Canadian defence contractors; further distribution only as approved
( ) Distribution limited to government departments and agencies; further distribution only as approved
( ) Distribution limited to defence departments; further distribution only as approved
( ) Other (please specify):

12. DOCUMENT ANNOUNCEMENT (any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availabilty (11). However, where further distribution (beyond the audience specified in 11) is possible, a wider announcement audience may be selected.)

UNLIMITED

UNCLASSIFIED

SECURITY CLASSIFICATION OF FORM

13. ABSTRACT (a brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), or (U). It is not necessary to include here abstracts in both offical languages unless the text is bilingual).

(U) DREO developed an Elint database browsing tool, called DEBU, that allows Elint databases, such as Kilting, EWIR and AFEWC, to be easily reviewed and analyzed from a PC workstation. DEBU's basic function is to allow a user to examine the contents of user-selected subfiles of user-selected emitters of user-selected databases. DEBU augments this functionality with support for selecting (filtering) and combining subsets of emitters by user-selected attributes such as ELNOT, name, parameter type or parameter value. DEBU provides access to facilities for examining histograms and x-y plots of selected parameters as well as the generation and printing of a variety of reports. With its multiple windows, pop-up menus and help support, DEBU is easy to use.

14. KEYWORDS, DESCRIPTORS or IDENTIFIERS (technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus. e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus-identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

ELINT
DATABASES
ESM
EWIR
KILTING

UNCLASSIFIED

SECURITY CLASSIFICATION OF FORM